DEC STD 020-0 CAST METAL PARTS

DOCUMENT IDENTIFIER: A-DS-EL00020-00-0 Rev C1, 11-Sep-1989

ABSTRACT: This standard is a source of information for specifying raw materials for use in making cast metal parts. Attendant material and part quality requirements are also included.

APPLICABILITY: Mandatory for use by Digital personnel responsible for defining raw material on documentation.

STATUS: Approved 11-Sep-1989; see $VTX SMC for expiration date.

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Responsible Person:	Richard J. Ceremsak

APPROVAL: This standard has been reviewed and recommended for approval by the General Review Group for DEC STD 020-6 and approved for use throughout Digital.

Richard J. Ceremsak, Advanced Materials and Process Technology

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Eric Williams, Standards Process Manager

Direct requests for further information to:

Richard J. Ceremsak

MLO6-2/T13, DTN: 223-3569, EUCLID::CEREMSAK

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1 INTRODUCTION

1.1 PURPOSE

This document is an information source for specifying raw materials intended for use in making cast metallic parts. Attendant material/part quality requirements are included.

1.2 SCOPE

This standard provides references to industry specifications that define the requirements for cast metal parts. These can be made using any one of many casting processes and/or materials. Other aspects of raw material and/or parts quality are also covered in these specifications. They include, but are not limited to test methods, mechanical properties, process control and inspection.

The use of this standard enables the initial selection of raw material. It is not intended to be a design guide. That need is better served by the recommendations from vendors of proven competence. The ultimate selection of a specific casting process will be dependent upon a joint effort by the designer and the prospective casting vendor(s).

NOTE

Additional materials or alloys can be included in this standard, if appropriate, by contacting the Responsible Person indicated on the Document Management Page.

1.3 AVAILABLE CASTING STANDARDS

ASTM NUMBER	STANDARD SPECIFICATION TITLE
B85-84*	ALUMINUM-ALLOY DIE CASTINGS
B176-79	COPPER-ALLOY DIE CASTINGS
B94-82*	MAGNESIUM-ALLOY DIE CASTINGS
B86-83*	ZINC-ALLOY DIE CASTINGS
B26-86*	ALUMINUM-ALLOY SAND CASTINGS
B584-85b*	COPPER-ALLOY SAND CASTINGS FOR GENERAL APPLICATIONS
A27-85	CARBON-STEEL CASTINGS FOR GENERAL APPLICATIONS
A536-84	DUCTILE IRON CASTINGS
A48-83*	GRAY IRON CASTINGS
B80-85	MAGNESIUM-ALLOY SAND CASTINGS
B618-85*	ALUMINUM-ALLOY INVESTMENT CASTINGS
A732-85	CARBON AND LOW-ALLOY STEEL INVESTMENT CASTINGS FOR GENERAL APPLICATIONS
B403-84	MAGNESIUM-ALLOY INVESTMENT CASTINGS
B669-84E1	ZINC ALLOYS IN INGOT FORM FOR FOUNDRY CASTINGS

* These ASTM Specifications are included in the Material Identifier Tables.

2 RESPONSIBILITIES

Design engineers are responsible for defining raw material on documentation by using the conventions described in main heading 3 of this standard. Design engineers should consult with Advanced Materials and Process Technology (AMPT) if a Material Identifier cannot be determined.

3 REQUIREMENTS

3.1 QUALITY

Final property and quality requirements should be based on the evaluation of prototype parts that are the product of a specific raw material and a given casting process, as conducted by a specified vendor.

Once the final part requirements have been defined and met, based on actual part evaluation and qualification, subsequent changes in source (vendor), raw materials and/or the manufacturing process are prohibited. Such changes also include, but are not limited to, alteration of manufacturing tooling, inspection methods and process parameters/definition. Secondary sources for the parts must follow the same qualification process as the original vendor, with the same restrictions being levied once the qualification is complete.

Requested changes can be implemented, but must first be approved in writing, with qualifications if needed, by the appropriate Digital design engineering group.

3.2 ENGINEERING DRAWING

A drawing that depicts the finished, as-purchased part is recommended. A casting drawing, per se, is useful if parts are purchased as raw castings.

Drawing notes should define the cast part's quality characteristics in terms of specific inspection limits. These may be soundness, surface finish, and so forth. Most test procedures and inspection limits are defined in existing standards. These standards are listed under the heading, "Applicable Documents," in the respective ASTM Specification.

Casting repair procedures shall also be referenced. Generally, casting repair, for example, welding and impregnation, is the least desirable alternative in terms of cost and quality and should be prohibited. The reliable control of a properly defined process is a far better alternative.

Common reference/locating points, axes, and planes shall be used to position the cast parts for all dimensional inspections, machining, and other applicable processes. These locations are to be explicitly defined on the engineering drawing.

4 MATERIAL IDENTIFIER

Any given cast metallic material/part shall be referenced by an appropriate 3-4-3 Material Identifier on the engineering drawing. The "Material Identifier" specifies the material as cast metal, and points to the specific ASTM document which defines the cast part/material and its characteristics.

4.1 FORMAT

The cast Material Identifier has a 3-4-3 format and is structured as follows:

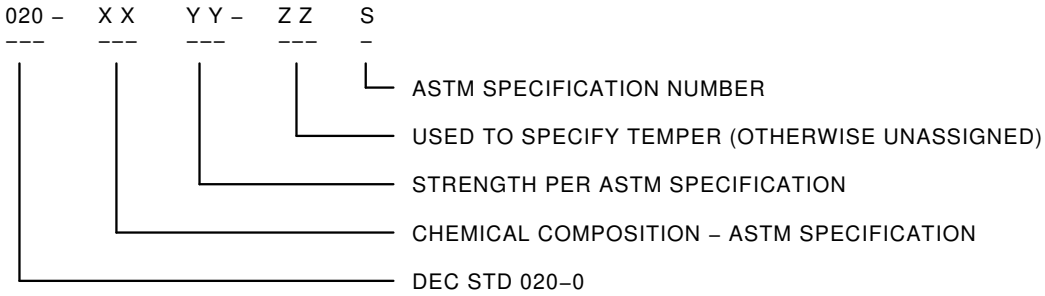
020 – X X Y Y – Z Z S
ASTM SPECIFICATION NUMBER
USED TO SPECIFY TEMPER (OTHERWISE UNASSIGNED)
STRENGTH PER ASTM SPECIFICATION
CHEMICAL COMPOSITION – ASTM SPECIFICATION
DEC STD 020–0

Table 1: Aluminum-Alloy Die Castings Per ASTM B85-84
Material Identifier 020 - XX YY - ZZ A

	(XX) ALLOY CODE		(YY) STRENGTH CODE	(ZZ) UNASSIGNED CODE
CODE	ANSI NO.	ALLOY NO.		
(AA)	UNS 03600	360	(AA) PER ASTM B85-84 PAR. 8, MECHANICAL PROPERTIES AND TESTS.	(AA) BLANK
(BB)	UNS 03800	380		
(CC)	UNS 03830	383		
(DD)	UNS 03840	384		
(EE)	UNS 04130	413		

Table 2: Magnesium-Alloy Die Castings Per ASTM B94-82
Material Identifier 020 - XX YY - ZZ B

	(XX) ALLOY CODE		(YY) STRENGTH CODE	(ZZ) UNASSIGNED CODE
CODE	ASTM NO.	ALLOY NO.		
(AA)	UNS M10600	AM60A	(AA) PER ASTM B94-82 PAR. 8, MECHANICAL PROPERTIES AND TESTS.	(AA) BLANK
(BB)	UNS M10410	AS41A		
(CC)	UNS M11910	AZ91A		
(DD)	UNS M11912	AZ91B		

Table 3: Zinc-Alloy Die Castings Per ASTM B86-83
Material Identifier 020 - XX YY - ZZ C

	(XX) ALLOY CODE		(YY) STRENGTH CODE	(ZZ) UNASSIGNED CODE
CODE	ASTM NO.	ALLOY NO.		
(AA)	UNS Z33521	AG40A	(AA) PER ASTM B86-83 PAR. 8, MECHANICAL PROPERTIES AND TESTS.	(AA) BLANK
(BB)	BLANK		(BB) BLANK	
(CC)	UNS Z35530	AC41A		
(DD)	UNS Z35635	8*		
(EE)	UNS Z35630	12*		

* These alloys correspond to Zinc Institute Alloy ZA8 and ZA12 in chemical composition. ASTM B669, Standard Specification for Zinc Alloys in Ingot Form for Foundry Castings, governs the material shown as (DD) and (EE) above. These requirements are exclusive of mechanical properties.

Table 4: Aluminum-Alloy Sand Castings Per ASTM B26-86
Material Identifier 020 - XX YY - ZZ D

	(XX) ALLOY CODE		(YY) STRENGTH CODE	(ZZ) TEMPER DESIGNATION CODE	
CODE	ANSI NO.	ALLOY NO.			
(AA)	UNS A03190	319	(AA) PER ASTM B26-86, PAR. 11, TENSILE PROPERTIES.	(AA)	F
(BB)	UNS A03550	355		(BB)	T5
(CC)	UNS A03560	356		(CC)	T6
(DD)	UNS A04430	443		(DD)	T7
(EE)	UNS A07710	771		(EE)	T51
				(FF)	T52
				(GG)	T71

Table 5: Copper-Alloy Sand Castings For General Applications Per ASTM B584-85b Material Identifier 020 - XX YY - ZZ E

(XX) ALLOY CODE			(YY) STRENGTH CODE	(ZZ) UNASSIGNED CODE
CODE	CDI NO.	ALLOY NO.		
(AA)	UNS C90500	1A ("G" BRONZE)	(AA) PER ASTM B584-85b PAR. 6, MECHANICAL PROPERTIES	(AA) BLANK
(BB)	UNS C86200	(HI-STRENGTH BRASS)		

Table 6: Gray Iron Castings Per ASTM A48-83 Material Identifier 020 - XX YY - ZZ F

(XX) ALLOY CODE		(YY) STRENGTH CODE		(ZZ) UNASSIGNED CODE
CODE	CLASS NO.	CODE	CLASS LETTER *	
(AA)	20	(AA)	"A"	(AA) BLANK
(BB)	30	(BB)	"B"	
(CC)	40	(CC)	"C"	
(DD)	50	(DD)	"S"	
(EE)	60			

* The correct specification of material, in the case of gray cast iron, combines the "Class Number" (minimum tensile strength, KSI) with a "Class Letter" (test bar size). For example, Class 40B.

Table 7: Aluminum Investment Castings Per ASTM B618-85 Material Identifier 020 - XX YY - ZZ G

(XX) ALLOY CODE			(YY) STRENGTH CODE	(ZZ) TEMPER DESIGNATION CODE	
CODE	ANSI NO.	ALLOY NO.			
(AA)	UNS A03190	319	(AA) PER ASTM B618-85 PAR. 10, TENSILE REQUIREMENTS.	(AA)	F
(BB)	UNS A03550	355		(BB)	T5
(CC)	UNS A03560	356		(CC)	T6
(DD)	UNS A07710	771		(DD)	T7
				(EE)	T51
				(FF)	T52
				(GG)	T71

APPENDIX A

REFERENCED DOCUMENTS

A.1 ASTM Documents

	ASTM Document Number	Document Title
o	ASTM B85-84	*Aluminum-Alloy Die Castings*
x	ASTM B176-79	*Copper-Alloy Die Castings*
x	ASTM B94-82	*Magnesium-Alloy Die Castings*
o	ASTM B86-83	*Zinc-Alloy Die Castings*
o	ASTM B26-86	*Aluminum-Alloy Sand Castings*
o	ASTM B584-85b	*Copper-Alloy Sand Castings for General Applications*
o	ASTM A27-85	*Carbon-Steel Castings for General Applications*
o	ASTM A536-84	*Ductile Iron Castings*
o	ASTM A48-83	*Gray Iron Castings*
o	ASTM B80-85	*Magnesium-Alloy Sand Castings*
o	ASTM B618-85	*Aluminum-Alloy Investment Castings*
x	ASTM A732-85	*Carbon and Low-Alloy Steel Investment Castings for General Applications*
o	ASTM B403-84	*Magnesium-Alloy Investment Castings*
x	ASTM B669-84 ^{E1*}	*Zinc Alloys in Ingot Form for Foundry Castings*

o Indicates that the standard has been adopted by the Department of Defense.

x Indicates that the standard has not been adopted by the Department of Defense.

* Indicates "Editorial Change" since last revision.

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